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CIRCULAR No. 34.

(B. A. I. 163.)

United States Department of Agriculture,

BUREAU OF ANIMAL INDUSTRY.

D. E. SALMON, D. V. M., Chief.

NOTES ON PARASITES—55-57.

55: A PUPA-LIKE STAGE IN THE DEVELOPMENT OF THE SPINOSE EAR TICK (*ORNITHODOROS MEGNINI*) OF CATTLE.

Among the cattle ticks (*Ixodidae* s. l.) which have been sent to the Bureau of Animal Industry for determination have been several lots of the so-called Ear Tick. Specimens of this parasite have been received from Texas, New Mexico, California, and Nebraska; and several correspondents have complained that it is very injurious to cattle, causing not only sickness but, in some cases, death—a view not concurred in by all persons.

In one sending, a female had oviposited, and from the eggs we obtained the hexapod embryo. This embryo is elongate-oval, with long terminal capitulum, the animal measuring 0.61 mm. in length from the tip of the hypostome to the posterior margin of the body. The integument is finely striated and is pierced by symmetrically arranged pores, from which bristly hairs issue. The palpi and hypostome are practically of equal length; hypostome with two rows of denticles on each half; palpi, first and fourth articles short and nearly of equal length; second and third articles elongate and of about equal length.

In one sending of Ear Ticks we observed several peculiar pyriform bodies, white in color, about 4 mm. long by 2 mm. broad. Closer examination showed these to be a developmental stage, consisting of a smooth outer sack composed of a hexapod skin, with the anterior portion considerably drawn out and bearing on its extremity the mouth parts of the hexapod embryo, with two rows of denticles on each half of the hypostome. Inside of this hexapod smooth sack was a well-developed octopod spinose stage, with well-developed, stout claws on the tarsi, the characteristic pedunculate stigmata, capitulum subterminal, hypostome with four rows of denticles on each half.

The white pyriform structures are, accordingly, the transition stage from the hexapod embryo of *Ornithodoros Megnini* to the smallest octopod form of Marx's *Rhynchoprium spinosum*. Upon several occasions we have received specimens of Marx's "*R. spinosum*," and have seen them change by ecdysis to *Ornithodoros*

Megnini (Dugès); so that we can confirm beyond question the statement that such a change does take place.

We have not observed this pyriform stage on cattle, but the specimens in question were taken on postmortem examination from the ear of *Bos taurus*; so that the change from the hexapod to the octopod stage evidently occurs in that place. Furthermore, it is apparently a kind of resting, or pupal, stage, as is shown by the fact that the surrounding, discarded integument, instead of appearing as skins ordinarily do under such circumstances, has become elongated and assumed a pyriform shape, the cephalic portion—that of attachment to the host's skin—being the narrower, the posterior portion being much broader. The weight of the tick would naturally bring about this pyriform shape.

The various stages in question will be illustrated in an article on the North American cattle ticks, which will appear in the Seventeenth Annual Report of the Bureau of Animal Industry.

* 56: **BOOPHILUS AUSTRALIS PRESENT IN CUBA, PORTO RICO, VENEZUELA, AND INDIA.**

When the Australian Commission (Dr. Hunt and Mr. Collins) visited Washington to compare the Australian red water with Texas fever, several of the Australian ticks which transmit the disease were submitted to us for comparison with the North American *Boophilus annulatus* (*B. bovis*). At that time we took the position that the Australian specimens, while closely related to our American species, represented at least a distinct variety and, in all probability, a distinct species.

Professor Neumann, of Toulouse, France, reexamined (1897) these same specimens, and considered them not only specifically but also varietally identical with *B. bovis* (*Rhipicephalus annulatus* (Say) Neumann). Later, Fuller (1899) compared Australian, African, and North American forms, pronounced them distinct, and described the Australian tick as a new species—*Rhipicephalus australis*. The three species in question are differentiated as follows:

1. Hypostome with six rows of denticles; male with distinct horny tail—South African form *Boophilus decoloratus*.
Hypostome with eight rows of denticles 2
2. Male with distinct horny tail—Australian form *B. australis*.
Male without horny tail—North American form *B. annulatus*.

Recently several bottles of ticks have been submitted to us for identification, and the results are interesting from a standpoint of zoo-geography.

Let it be recalled that, while our North American *Boophilus* varies greatly in color, all adult specimens thus far examined in detail by us have presented eight rows of denticles, but no male has exhibited

a caudal appendage. The following specimens agree with the Australian and North American forms in possessing eight rows of denticles:

B. A. I. No. 3044, from Cuba.

B. A. I. No. 3076-3077, from Porto Rico.

B. A. I. No. 2997, from Venezuelan cattle (taken at Boston, Mass.).

B. A. I. No. 2976-2979, from Shongwa, Prome, and Mandalay districts, India.

In one bottle from India no males are present, but in all the other seven bottles referred to, males are found, all of which possess the caudal appendage.

There is a very slight difference in the appearance of the denticles of the American and Indian specimens, but we do not at present find ourselves in a position to attach much importance to this point. Accordingly, we conclude that a cattle tick which differs from *B. annulatus* of North America, but which agrees in essential characters with *B. australis* (Fuller), occurs in Cuba, Porto Rico, Venezuela, and India. Furthermore, the tick determined as *Boophilus bovis* by Lignières (1900) in Argentine Republic, also agrees in these two important characters with *B. australis*. The relations of *Boophilus australis* (Fuller) to Neumann's *Rh. annulatus caudatus*, from Japan, remain to be determined by further comparison of specimens. The latter form is described as possessing ten rows of denticles on the hypostome, while the male possesses a caudal appendage. Fuller admits it as a distinct species, and in this view he is probably correct.

It is not clear to us why Neumann considers two such distinct forms as *annulatus* and *australis* even varietally identical when he separates into distinct species two forms like *Dermacentor reticulatus* and *D. variegatus*.

Regarding the nomenclature of the North American cattle tick, although it has been impossible for us to obtain Say's types of *Ixodes annulatus*, taken from the Virginia deer in Florida, we agree with Neumann in the view that there is scarcely any reasonable doubt regarding the identity of *annulatus* and *bovis*. We are not, however, prepared to reject the genus *Boophilus*. The forms in question (*annulatus*, *australis*, and *decoloratus*) agree with each other in rather essential characters, by which same characters they differ from the type of *Rhipicephalus*. *Boophilus*, in our opinion, is entitled at least to subgeneric rank under *Rhipicephalus*, and it does not appear to us entirely unreasonable to give it a distinct generic rank. There are, in fact, certain very strong, practical reasons, from an official standpoint, why we should accept the name *Boophilus*, unless strong, scientific arguments for not doing so can be advanced. Hence, we hold, at least for the present, to *Boophilus annulatus*, *B. australis*, and *B. decoloratus*.

57: A NEW HOST FOR STRONGYLUS CONTORTUS AND CYSTICERCUS TENUICOLLIS.

In a postmortem examination made upon a mule deer [*Cervus macrotis* (Say)] which died at the National Zoological Park, we have found the twisted strongyle (*Strongylus contortus*) in the fourth stomach and the long-necked bladder worm (*Cysticercus tenuicollis*) attached to the lungs and mesentery. So far as our records go this is a new host for both of the parasites.

The immediate cause of death was pneumonia, but the extreme anemic condition of the animal was probably due to the strongyles.

CH. WARDELL STILES, Ph. D.,
Zoologist,
Bureau of Animal Industry.
 ALBERT HASSALL, M. R. C. V. S.,
Acting Assistant Zoologist,
Bureau of Animal Industry.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., March 26, 1901.